

Trends in the science proficiency of 9-, 13-, and 17-year-olds

Competence in science is an important outcome of education. The ability to apply scientific information, interpret data, and make inferences about scientific findings is required in a world that relies heavily on technological and scientific advances. Aside from workplace requirements, science proficiency is crucial in understanding environmental, medical, economic, and other issues that confront modern societies.

- Average science achievement scores rose for all three age levels between 1982 and 1996. However, when compared to scores from the 1970s, the 1996 average scores were higher at age 9, about the same at age 13, and lower at age 17.
 - In 1996, the average science proficiency of blacks and Hispanics remained well below that of whites. However, the proficiency gap between whites and blacks at age 9 was smaller in 1996 than in 1970, and between whites and Hispanics at age 13, the gap was smaller in 1996 than in 1977.
 - A higher percentage of 9- and 13-year-olds demonstrated general science skills by reaching level
- 250 in 1996 than in 1982. Additionally, more 17-year-olds reached levels 300 and 350 in 1996, exhibiting detailed knowledge and analytical understanding of scientific principles and the ability to integrate specialized scientific information (see supplemental table 19-2).
- There is much variation in science proficiency scores within age groups. For example, in 1996, the proficiency of white 9-year-olds varied by 131 scale points, from the 5th percentile to the 95th percentile. By comparison, the difference in the median proficiency of white 9- and 17-year-olds was 69 scale points (see supplemental table 19-3).

Average science proficiency (scale score), by sex and age: 1970–96

Year	Total			Male			Female		
	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17
1970	1225	255	1305	228	257	1314	1223	253	1297
1973	220	250	296	223	252	304	218	247	288
1977	1,2220	1,2247	2290	1,2222	1,2251	2297	1,2218	1,2244	1,2282
1982	1221	1,2250	1,2283	1,2221	256	1,2292	1221	1,2245	1,2275
1986	1224	1251	1,2289	1227	256	2295	1221	1,2247	1,2282
1990	229	255	290	230	259	2296	227	252	2285
1992	231	258	294	235	260	2299	227	256	2289
1994	231	257	294	232	259	2300	230	254	2289
1996	230	256	296	232	261	2300	228	252	2292

Average science proficiency (scale score), by race/ethnicity and age: 1970–96

Year	White			Black			Hispanic		
	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17
1970	236	263	1312	179	1215	258	—	—	—
1973	231	259	304	177	205	250	—	—	—
1977	1,2230	1,2256	1,2298	175	1208	1,2240	192	1213	262
1982	1,2229	1,2257	1,2293	187	1217	1,2235	189	2226	249
1986	1,2232	1259	1,2298	2196	222	253	199	2226	259
1990	238	264	2301	2196	2226	253	206	232	262
1992	239	267	2304	2200	224	256	205	238	270
1994	240	267	2306	2201	224	257	201	232	261
1996	239	266	2307	2202	226	260	207	232	269

— Not available.

¹ Statistically significant difference from 1996.

² Statistically significant from 1970 for whites and blacks, and from 1977 for Hispanics.

NOTE: See the supplemental note to *Indicator 16* for further discussion of the NAEP assessments. The science proficiency scale has a range from 0 to 500. (See supplemental table 19-1 for detailed explanations of levels.)

Level 150: Knows everyday science facts

Level 200: Understands simple scientific principles

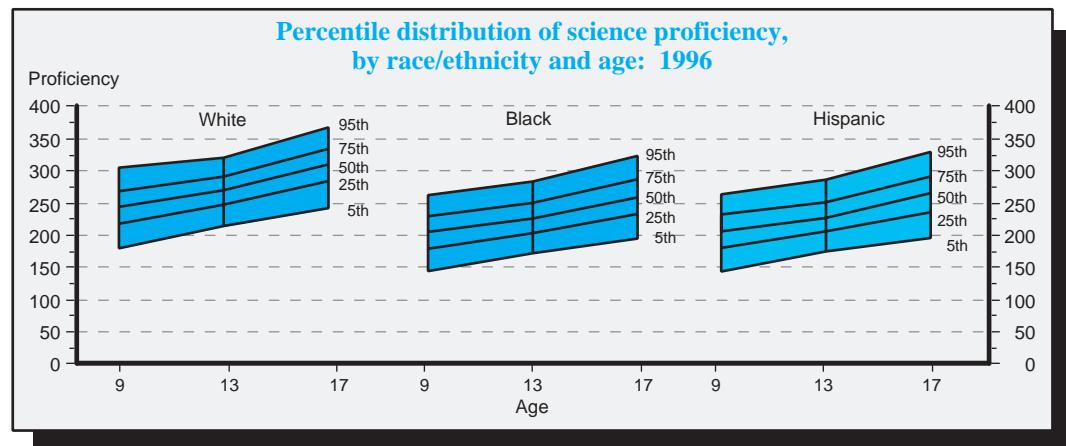
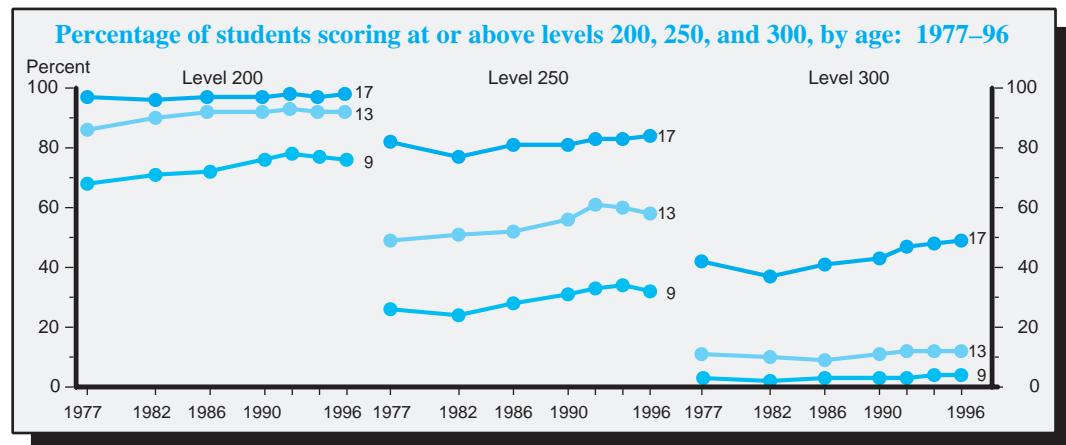
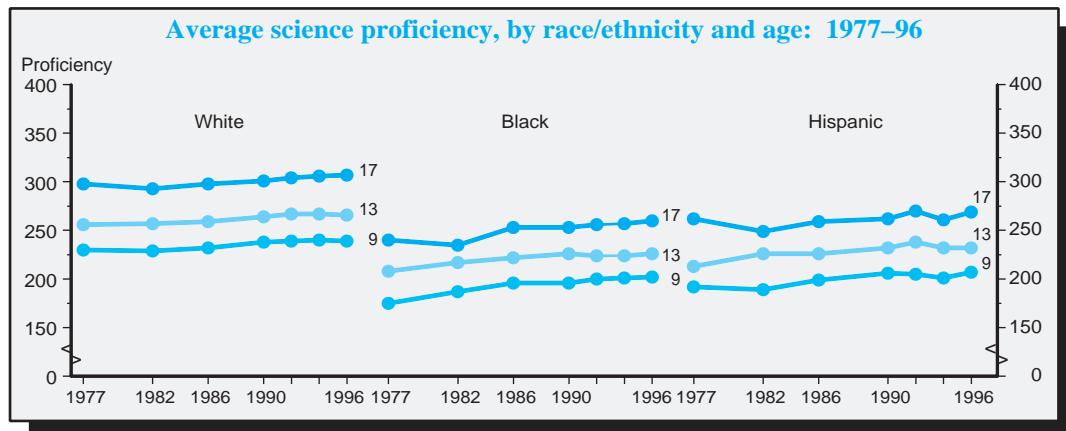
Level 250: Applies general scientific information

Level 300: Analyzes scientific procedures and data

Level 350: Integrates specialized scientific information

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress, NAEP 1996 Trends in Academic Progress, 1998.

Average science proficiency (scale score)



NOTE: The science proficiency scale has a range from 0 to 500. (See supplemental table 19-1 for further explanation of levels.)

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress, *NAEP 1996 Trends in Academic Progress*, 1998.

Table 19-1 Explanations of levels of science proficiency**Level 150: Knows everyday science facts**

Students at this level know some general scientific facts of the type that could be learned from everyday experiences. They can read simple graphs, match the distinguishing characteristics of animals, and predict the operation of familiar apparatus that work according to mechanical principles.

Level 200: Understands simple scientific principles

Students at this level are developing some understanding of simple scientific principles, particularly in the life sciences. For example, they exhibit some rudimentary knowledge of the structure and function of plants and animals.

Level 250: Applies general scientific information

Students at this level can interpret data from simple tables and make inferences about the outcomes of experimental procedures. They exhibit knowledge and understanding of the life sciences, including a familiarity with some aspects of animal behavior and of ecological relationships. These students also demonstrate some knowledge of basic information from the physical sciences.

Level 300: Analyzes scientific procedures and data

Students at this level can evaluate the appropriateness of the design of an experiment. They have detailed scientific knowledge, and the skill to apply their knowledge in interpreting more information from text and graphs. These students also exhibit a growing understanding of principles from the physical sciences.

Level 350: Integrates specialized scientific information

Students at this level can infer relationships and draw conclusions using detailed scientific knowledge from the physical sciences, particularly chemistry. They also can apply basic principles of genetics and interpret the societal implications of research in this field.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress, *NAEP 1996 Trends in Academic Progress*, 1997.

Table 19-2 Percentage of students scoring at or above five levels of science proficiency: 1977–96

Proficiency level	Age	Year					
		1977	1982	1986	1990	1992	1994
Level 150:	9	¹ 94	95	^{1,2} 96	² 97	² 97	² 97
Knows everyday	13	¹ 99	² 100	² 100	² 100	² 100	² 100
science facts	17	100	100	100	100	² 100	100
Level 200:	9	¹ 68	¹ 71	^{1,2} 72	² 76	² 78	² 77
Understands simple	13	¹ 86	^{1,2} 90	² 92	² 92	² 93	² 92
scientific principles	17	97	96	97	97	98	98
Level 250:	9	¹ 26	¹ 24	¹ 28	² 31	² 33	² 34
Applies general	13	¹ 49	¹ 51	¹ 53	^{1,2} 57	² 61	² 60
scientific information	17	82	^{1,2} 77	81	81	83	84
Level 300:	9	¹ 3	2	3	3	3	² 4
Analyzes scientific	13	11	10	9	11	12	12
procedures and data	17	¹ 42	^{1,2} 37	¹ 41	43	² 47	² 48
Level 350:	9	0	0	0	0	0	0
Integrates specialized	13	1	0	² 0	0	² 0	0
scientific information	17	9	¹ 7	8	9	10	² 11

¹ Statistically significant difference from 1996.² Statistically significant difference from 1977.NOTE: See the supplemental note to *Indicator 16* for further discussion of the NAEP assessments.SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress, *NAEP 1996 Trends in Academic Progress*, 1997.

Table 19-3 Percentile distribution of science proficiency scores, by age and race/ethnicity: 1977–96

Per-	Age 9							Age 13							Age 17							
	centile	1977	1982	1986	1990	1992	1994	1996	1977	1982	1986	1990	1992	1994	1996	1977	1982	1986	1990	1992	1994	1996
All students																						
5	144	151	155	160	163	161	160	174	185	189	191	193	191	191	213	203	212	210	218	212	218	
10	161	167	170	176	178	177	174	191	200	203	206	209	207	205	231	222	230	229	234	232	235	
25	190	194	196	202	204	203	201	218	224	227	230	235	233	230	261	252	260	260	264	265	266	
50	222	221	225	230	232	233	231	249	251	252	256	260	259	258	291	285	290	292	296	297	298	
75	251	249	253	257	258	260	259	278	277	277	281	284	283	283	320	315	319	323	327	326	327	
90	276	272	277	279	281	282	283	302	299	298	302	303	303	304	346	342	344	348	350	350	352	
95	291	286	291	292	294	295	298	317	313	310	315	314	314	317	362	357	360	363	364	363	365	
White																						
5	163	167	167	177	178	177	172	191	198	204	209	213	212	208	231	223	228	233	234	238	237	
10	178	182	181	190	192	191	187	205	211	216	220	226	225	221	246	239	245	249	251	254	253	
25	202	204	206	213	215	215	212	229	233	237	241	246	245	243	270	266	271	273	277	280	281	
50	230	229	233	238	240	242	240	256	258	259	265	268	267	267	298	294	299	301	306	308	309	
75	257	255	259	262	264	266	266	283	282	282	287	289	289	289	325	321	325	329	333	334	335	
90	281	278	282	284	285	287	289	307	303	302	307	307	307	309	350	346	349	352	355	356	357	
95	295	291	295	296	298	300	303	321	316	314	319	318	318	321	365	361	364	367	368	369	370	
Black																						
5	107	124	133	131	138	138	139	144	160	168	170	162	168	168	172	166	189	182	192	186	191	
10	123	137	147	145	152	153	153	158	173	180	182	177	180	181	187	181	202	197	207	202	208	
25	147	159	170	170	174	175	176	181	194	198	202	199	198	201	212	206	225	220	230	229	232	
50	174	188	196	196	201	202	203	207	217	221	226	224	223	225	240	235	252	252	255	258	259	
75	203	214	223	224	226	228	228	235	241	244	249	251	247	251	268	263	280	283	282	285	289	
90	229	236	246	247	248	252	251	260	262	264	269	272	272	271	293	289	306	314	308	310	315	
95	244	246	260	260	263	264	275	275	277	283	286	287	286	310	305	323	329	325	322	328		
Hispanic																						
5	125	127	134	146	143	139	143	147	166	171	174	180	175	175	194	178	194	189	197	186	197	
10	140	142	148	159	157	152	157	161	179	181	185	193	187	187	208	194	209	204	215	199	212	
25	164	162	173	181	179	176	181	186	201	202	206	215	207	208	234	219	232	231	242	226	240	
50	191	191	200	206	205	200	208	213	226	226	231	238	231	231	262	248	259	260	273	263	271	
75	219	216	226	233	230	227	235	240	249	250	256	261	258	256	290	278	286	293	298	296	298	
90	246	236	252	253	254	251	255	266	271	270	280	282	277	280	317	302	310	317	323	321	323	
95	261	246	265	267	265	264	268	282	285	283	294	292	290	293	331	321	324	330	339	336	339	

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress, NAEP 1996 Trends in Academic Progress, 1998.

Table S19(a) Standard errors for the first text table in *Indicator 19*

Year	Total			Male			Female		
	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17
1970	1.2	1.1	1.0	1.3	1.3	1.2	1.2	1.2	1.1
1973	1.2	1.1	1.0	1.3	1.3	1.2	1.2	1.2	1.1
1977	1.2	1.1	1.0	1.3	1.3	1.2	1.2	1.2	1.1
1982	1.8	1.3	1.2	2.3	1.5	1.4	2.0	1.3	1.3
1986	1.2	1.4	1.4	1.4	1.6	1.9	1.4	1.5	1.5
1990	0.8	0.9	1.1	1.1	1.1	1.3	1.0	1.1	1.6
1992	1.0	0.8	1.3	1.2	1.2	1.7	1.0	1.0	1.5
1994	1.2	1.0	1.6	1.3	1.2	2.0	1.4	1.2	1.7
1996	1.2	1.0	1.2	1.7	1.0	1.6	1.5	1.3	1.4

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress, *NAEP 1996 Trends in Academic Progress*, 1998.

Table S19(b) Standard errors for the second text table in *Indicator 19*

Year	White			Black			Hispanic		
	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17	Age 9	Age 13	Age 17
1970	0.9	0.8	0.8	1.9	2.4	1.5	—	—	—
1973	0.9	0.8	0.8	1.9	2.4	1.5	—	—	—
1977	0.9	0.8	0.7	1.8	2.4	1.5	2.7	1.9	2.2
1982	1.9	1.1	1.0	3.0	1.3	1.7	4.2	3.9	2.3
1986	1.2	1.4	1.7	1.9	2.5	2.9	3.1	3.1	3.8
1990	0.8	0.9	1.1	2.0	3.1	4.5	2.2	2.6	4.4
1992	1.0	1.0	1.3	2.7	2.7	3.2	2.8	2.6	5.6
1994	1.3	1.0	1.5	1.7	4.2	3.1	2.7	2.4	6.7
1996	1.4	1.1	1.2	3.0	2.1	2.4	2.8	2.5	3.3

— Not available.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress, *NAEP 1996 Trends in Academic Progress*, 1998.